

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1- 10 (Cancelled)

11. (New) An apparatus for generating pre-whirl of supply air to an inlet (18) of a radial compressor (12-22) comprising:

a housing (28) for said pre-whirl generating apparatus (26), said housing (28) being mounted adjacent to said inlet (18) of said compressor (12-22) and forming an intake channel (34) for supply air in communication with and leading to said inlet (18);

a deformable air deflecting vane (46) positioned in said channel (34), said vane (46) having a leading edge (60) and a trailing edge (62), said leading edge (60) being fixed in said channel (34), and said trailing edge (62) being free to be deflected with respect to said channel (34) to deflect air passing through said channel (34); and

means for selectively deflecting said trailing edge (62) of said vane (46) so that said vane (46) will deflect air passing through said channel (34) to generate a pre-whirl flow in either a positive, neutral, or negative direction at said inlet (18) of said compressor (12-22).

12. (New) The apparatus of claim 11, wherein said vane (46), in its undeflected position, is arranged in line with

normal flow through said channel (34) and does not deflect air flowing through said channel (34).

13. (New) The apparatus of claim 12, wherein said trailing edge (62) of said vane (46) can be deflected in a first direction to generate said positive pre-whirl flow or in a second direction to generate said negative pre-whirl flow.

14. (New) The apparatus of claim 11, wherein said trailing edge (62) of said vane (46) is reinforced for stiffness.

15. (New) The apparatus of claim 14, wherein said trailing edge (62) is an area of increased thickness of said vane (46) along said trailing edge (62).

16. (New) The apparatus of claim 14, wherein said trailing edge (62) has a crimp along said trailing edge (62).

17. (New) The apparatus of claim 11, wherein said means for deflecting said vane (46) is an annular ring (30) within said housing (28) arranged to rotate around said channel (34) in a plane perpendicular to the direction of said air passing through said channel (34), said ring (30) being in contact with said trailing edge (62) of said vane (46) to mechanically deflect said trailing edge (62) of said vane (46) either in a positive or negative pre-whirl direction in response to rotation of said ring (30) around said channel (34).

18. (New) The apparatus of claim 17, wherein said vane (46), in its natural undeflected position, is arranged in line with normal flow through said channel (34) and does not deflect air flowing through said channel (34).

19. (New) The apparatus of claim 18, wherein said trailing edge (62) of said vane (46) can be deflected in a first direction to generate said positive pre-whirl flow or in a second direction to generate said negative pre-whirl flow.

20. (New) The apparatus of claim 17, wherein said ring (30) contacts said trailing edge (62) of said vane (46) at a contact area near the radially outer corner of said trailing edge (62) of said vane (46), said contact area being received in a generally axially oriented slot (66) in said ring (30), whereby upon rotation of said ring (30) in a first positive direction around said channel (34), said vane (46) is deflected to a position that deflects air flowing through said channel (34) into a positive pre-whirl flow at said inlet (18), and upon rotation of said ring (30) in a second negative direction around said channel (34), said vane (46) is deflected to a position that deflects air flowing through said channel (34) into a negative pre-whirl flow at said inlet (18).

21. (New) The apparatus of claim 20, wherein said contact area is a tab extending from the radially outer corner of said trailing edge (62) of said vane (46), and said tab includes means for contacting said slot (66) in a

way that allows control of said trailing edge (62) of said vane (46) to effect deflection of said vane (46) while permitting twisting of said tab in said slot (66) to accommodate deflection of said vane (46).

22. (New) The apparatus of claim 21, wherein said slot (66) has lateral walls for contacting said tabs.

23. (New) The apparatus of claim 22, wherein said tab has at least one generally convex lateral bearing surface for contacting said wall.

24. (New) The apparatus of claim 23, wherein said tab has two lateral bearing surfaces on opposite sides of said tab for contacting opposite lateral walls of said slot (66).

25. (New) The apparatus of claim 24, wherein said lateral bearing surfaces are generally hemispherical.

26. (New) The apparatus of claim 23, wherein said trailing edge (62) has a crimp and said crimp extends through said tab forming said generally convex lateral bearing surface.

27. (New) The apparatus of claim 17, wherein said means for deflecting said vane (46) includes a pinion gear cooperating with a rack gear on said ring (30) to rotate said ring (30) in either a first rotational direction or a second rotational direction.

28. (New) The apparatus of claim 11, wherein said means for deflecting said vane (46) is an annular ring (30) within said housing (28) arranged to rotate around said channel (34) in a plane perpendicular to the direction of said air passing through said channel (34), said ring (30) being in contact with said vane (46) to mechanically deflect said vane (46) either in a positive or negative pre-whirl direction in response to rotation of said ring (30) around said channel (34), wherein said ring (30) has at least two tabs extending radially inwardly to receive said vane (46) therebetween and to effect deflection of said vane (46) upon rotation of said ring (30).

29. (New) The apparatus of claim 11, wherein said leading edge (60) of said vane (46) is circumferentially fixed in said channel (34) and said trailing edge (62) is free to be deflected circumferentially in said channel (34), and wherein said channel (34) has a generally helical groove, wherein said leading edge (60) of said vane (46) is affixed to a vane carrier (32) that is restricted from rotation in said channel (34), but is free to move axially in said channel (34), and wherein said trailing edge (62) of said vane (46) has a tab extending radially outwardly, said tab being received in said groove, and said means for deflecting said vane (46) is operative to move said vane carrier (32) axially within said housing (28) to cause said tab to move axially within said groove, thereby causing circumferential deflection of said trailing edge (62) of said vane (46).

30. (New) The apparatus of claim 29, wherein said vane carrier (32) includes a rack gear and said means for deflecting said vane (46) is a pinion gear mounted on said housing (28) for cooperation with said rack gear on said vane carrier (32) to move said vane carrier (32) axially in said housing (28).

31. (New) The apparatus of claim 29, wherein said grooves have axial ends, said vanes (46) are aligned with normal flow through said channel (34) and do not deflect air passing through said channel (34) when said vane carrier (32) is in an axial position to place said tab in a position in said groove intermediate of the axial ends of said groove.

32. (New) The apparatus of claim 29, wherein axial movement of said vane carrier (32) toward said inlet (18) causes deflection of said vane (46) in a first direction, and axial movement of said vane carrier (32) away from said inlet (18) causes deflection of said vane (46) in a second direction.

33. (New) The apparatus of claim 32, wherein deflection in said first direction causes positive pre-whirl flow at said inlet (18), and deflection in said second direction causes negative pre-whirl flow at said inlet (18).

34. (New) The apparatus of claim 33, wherein said intermediate position of said tab in said groove, in which said vanes (46) do not deflect air passing through said

channel (34), is closer to the axial end of said groove away from inlet (18) than the end nearest said inlet (18).

35. (New) The apparatus of claim 34, wherein said groove is arranged to provide a greater deflection of said trailing edge (62) of said vane (46) when said vane carrier (32) is moved toward said inlet (18) than when said vane carrier (32) is moved away from said inlet (18).

36. (New) The apparatus of claim 11, wherein said channel (34) is generally perpendicular to the axis of said compressor (12-22) and said vane (46) is mounted along a wall of said channel (34) so that in its undeflected position, said vane (46) does not deflect air passing through said channel (34).

37. (New) The apparatus of claim 36, wherein said means for deflecting said vane (46) is an actuating arm positioned outside of said channel (34) adjacent to said trailing edge (62) of said vane (46) and extendable into said channel (34) to engage said trailing edge (62) of said vane (46) and to deflect said vane (46) into said channel (34), thereby positioning said vane (46) to deflect air passing through said channel (34).

38. (New) The apparatus of claim 37, wherein said actuating arm is a C-shaped actuator (162) received in a C-shaped recess in said housing (28), and wherein said actuating arm is rotatable through said recess to extend into said channel (34) to deflect said vane (46) into said channel (34).

39. (New) The apparatus of claim 38, wherein said C-shaped actuator (162), said C-shaped recess, and said inlet (18) are generally circular and are concentric.

40. (New) The apparatus of claim 39, wherein, when said actuator is extended into said channel (34) to deflect said vane (46) into said channel (34), said vane (46) deflects air flowing through said channel (34) to generate a pre-whirl flow at said inlet (18), and said C-shaped actuator (162) forms a generally circular chamber (172) for said pre-whirl flow adjacent to said inlet (18).

41. (New) The apparatus of claim 37, including two vanes (46) on opposite sides of said channel (34), and further including means for deflecting said each vane (46), said means being operative to deflect a first vane to generate a pre-whirl flow in a first direction and to deflect a second vane to generate a pre-whirl flow in a second direction.

42. (New) The apparatus of claim 41, wherein said actuating arm is a C-shaped actuator (162) received in a C-shaped recess in said housing (28) and is rotatable through said recess to extend into said channel (34) to deflect said vane (46) into said channel (34), wherein said apparatus includes two vanes on opposite sides of said channel (34), and said C-shaped actuator (162) is operative to deflect either vane into said channel (34).

43. (New) The apparatus of claim 42, wherein said C-shaped actuator (162), said C-shaped recess, and said inlet (18) are generally circular and are concentric.

44. (New) The apparatus of claim 43, wherein, when said actuator is extended into said channel (34) to deflect said vane (46) into said channel (34), said vane (46) deflects air flowing through said channel (34) to generate a pre-whirl flow at said inlet (18), and said C-shaped actuator (162) forms a generally circular chamber (172) for said pre-whirl flow adjacent to said inlet (18).

45. (New) The apparatus of claim 37, wherein said actuating arm is an arcuate deflecting actuator attached to a swing arm mounted to swing about a pivot to extend said actuator into said channel (34) and deflect said vane (46) into said channel (34).

46. (New) The apparatus of claim 37, wherein said vane (46) is a flexible membrane and said actuating arm is a pivotable actuator having a contact point for contacting said membrane and arranged to pivot into said channel (34) in contact with said membrane thereby deflecting said membrane into said channel (34).

47. (New) The apparatus of claim 46, wherein, when said pivotable actuator is pivoted into said channel (34), said contact point contacts said membrane at about its midpoint, and a portion of said membrane on one side of said contact point forms said vane (46), and the portion of

said membrane on the other side of said contact point forms a pre-whirl chamber adjacent to said inlet (18).

48. (New) The apparatus of claim 37, wherein said trailing edge (62) of said vane (46) has an attachment means to which is attached said leading edge (60) of a lower plate, said actuating arm contacts said trailing edge (62) of said vane (46) adjacent to said attachment means, and said trailing edge (62) of said lower plate is arranged for sliding engagement with the wall of said channel (34), whereby when said actuating arm is moved into said channel (34) to deflect said vane (46) into said channel (34), said leading edge (60) of said lower plate follows said trailing edge (62) of said vane (46) into said channel (34), and said trailing edge (62) of said lower plate slides along said wall of said channel (34).

49. (New) The apparatus of claim 48, wherein, when said leading edge (60) of said lower plate follows said trailing edge (62) of said vane (46) into said channel (34), and said trailing edge (62) of said lower plate slides along said wall of said channel (34), said lower plate forms a pre-whirl chamber adjacent to said inlet (18).

50. (New) The apparatus of claim 37, wherein a divider wall is provided in said channel (34) upstream of said vane (46).

51. (New) The apparatus of claim 36, wherein said inlet (18) is generally circular and said channel (34) is eccentric to the center of said inlet (18).

52. (New) The apparatus of claim 51, wherein said vane (46) is attached to a wall of said channel (34) farthest from said center of said inlet (18), and when said vane (46) is in its undeflected position, it does not deflect air passing through said channel (34), and a pre-whirl flow is generated at said inlet (18).

53. (New) The apparatus of claim 52, wherein the pre-whirl flow generated when said vane (46) is in its undeflected position is a negative pre-whirl flow.

54. (New) The apparatus of claim 51, wherein said vane (46) is attached to a wall of said channel (34) farthest from said center of said inlet (18), and when said vane (46) is deflected to an intermediate position, said vane (46) creates an absence of pre-whirl flow at said inlet (18).

55. (New) The apparatus of claim 51, wherein said vane (46) is attached to a wall of said channel (34) farthest from said center of said inlet (18), and when said vane (46) is fully deflected into said channel (34), said vane (46) creates a positive pre-whirl flow at said inlet (18).

56. (New) The apparatus of claim 51, wherein said means for deflecting said vane (46) is an actuating arm positioned outside of said channel (34) adjacent to said

trailing edge (62) of said vane (46) and extendable into said channel (34) to engage said trailing edge (62) of said vane (46) and to deflect said vane (46) into said channel (34), thereby positioning said vane (46) to deflect air passing through said channel (34), wherein said actuating arm is a C-shaped actuator (162) received in a C-shaped recess in said housing (28) and is rotatable through said recess to extend into said channel (34) to deflect said vane (46) into said channel (34).

57. (New) The apparatus of claim 56, wherein said C-shaped actuator (162), said C-shaped recess, and said inlet (18) are generally circular and are concentric.

58. (New) The apparatus of claim 57, wherein, when said actuator is extended into said channel (34) to deflect said vane (46) into said channel (34), said vane (46) deflects air flowing through said channel (34) to generate a pre-whirl flow at said inlet (18), and said C-shaped actuator (162) forms a generally circular chamber (172) for said pre-whirl flow adjacent to said inlet (18).